Green Energy – Guild Molecular Gate Technology

Digester Gas Treatment for Energy Production / Pipeline Gas Production from WWTP Digester Gas

The Ohio Water Environment Association
2009 BioSolids Systems Workshop

December 10, 2009

Guild Associates, Inc
• Molecular Gate for CO2 Removal
• Compressors
• Molecular Gate for N2 Rejection
• TSA dehydration
  – Water removal
• Sorbead “Quick-Cycle” dew point control
  – Water and heavy hydrocarbon removal systems
• NGL Removal for CARB standards
• CO2 removal for LNG / Peakshaver plants
• Membrane units
• Helium purifiers
• Chiller Packages
Spec Plant
Installed
Large unit
Installed
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Digester Gas Flow Balance – Single Step Processing

PRODUCT
Pressure as needed
CO2 = 1 to 2%
H2S = < 4 ppm
Siloxanes < 20 ppb
H2O = 7 lb/MM SCF

TAIL GAS
3 psig
CO2, H2S, H2O
Lost Hydrocarbons

FEED
CH4
CO2
H2S
Siloxanes
H2O

0 psig 100 psig

90 psig
Guild PSA And Vacuum Pump
Process Steps – Digester Gas

- Feed Compression
- Guild PSA and Vacuum Pump
- Tail Gas To Flare or Boilers
- Product
Digester Gas Upgrading Process Steps

Sales Gas
\[ \text{CO}_2 = 1 \text{ to } 2\% \]

Small Methane Purge

Adsorption
Flow
Upward

CO2
H2S
Siloxanes
VOC’s
H2O
FEED

Regen
Flow
Downward

CO2
Siloxanes – VOC
H2S
H2O

Vacuum Pump
“Tail Gas”
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Pipeline Acceptance

• Intrepid Technology and Resources, ID (Two units)
  – Extensive testing of product stream purity
  – Quality accepted by Intermountain Gas Company
  – Sales also accepted as CNG meeting DOT regulations
  – Removes 40% CO2 to <2%, Dehydrates, Removes 4000 ppm H2S to < 4 ppm.

• BioEnergy Solutions, CA (Vintage Dairy)
  – Sales to PG&E pipeline
  – Removes 30 to 40% CO2 to <1%, Dehydrates, A few hundred ppm H2S removed to < 4 ppm

• Newark WWTP (Ohio)
  – Producing pipeline quality gas
• H2S
  – May or may not require treatment.
  – Can treat on tail gas stream (preferred) or feed stream
  – Options:
    • No Treatment, Digester Additives, Biological Treatment, Sulfatreat / Iron Sponge, Liquid Redox

• Tail Gas Disposal
  – Enclosed thermal oxidizer if design for high methane recovery
  – Digester heating possible with combustion of tail gas.
  – Recovery of heat from compression or flare. Generally expensive and limited to larger flows

• Required Pipeline Pressure
  – High pressure requires additional compressor
Product Based Processing Costs, $/MCF
Includes = Feed compression, PSA, Flare, Pipeline Tap, Installation, Power (5 cents/kW), Maintenance, Man-Power
10 year project at 8% Loan

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Feed Flow, SCFM

- 200: 4.00
- 350: 3.00
- 500: 2.50
- 1000: 2.00
- 1800: 1.50
Tidelands CO2 Removal System

1 MM SCFD
38% CO2
Removed to <2%
Start-up May 2002
Large Biogas Feed Compressor
Small Feed Compressor
Spec Plant in Transit
Spec Plant Installed
Large unit
Installed
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